

**REMARKS**

In the Office Action, the Examiner rejected claims 1, 2 and 5-15. Claims 3, 4 and 16-21 have been withdrawn from consideration. By the present response, Applicants amend claims 1, 10, and 16, and cancel claims 8, 14, and 17. No additional claims are presently submitted, and no new matter is added by the present amendments. Applicants request reconsideration of the pending claims in view of the amendments set forth above and the following remarks.

**Rejection under 35 U.S.C. § 112, First Paragraph**

The Examiner rejected claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph as failing to comply with the enablement requirement. Additionally, the Examiner rejected claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. The Applicants respectfully traverse these rejections.

Regarding the rejection for failing to comply with the written description requirement, the Examiner stated that “[t]here is no support in the specification for the negative limitation that the die stacks do not include a lead frame.” Final Office Action, page 3. Applicants presently amend claims 1 and 10 to clearly place the claims in condition for allowance. Accordingly, in view of the present amendments, the rejection for failing to comply with the written description requirement is moot.

Regarding the enablement requirement, the Examiner has the initial burden to establish a *reasonable basis* to question the enablement provided for the claimed invention. *In re Wright*, 999 F.2d 1557, 1562, 27 U.S.P.Q.2d 1510, 1513 (Fed. Cir. 1993). The test for enablement, as set forth by the Supreme Court, is whether the experimentation needed to practice the invention is undue or unreasonable. *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916). A patent need not teach, and preferably omits, what is well known in the art. *In re Buchner*, 929 F.2d 660, 661, 18 U.S.P.Q.2d 1331, 1332 (Fed. Cir. 1991). The *undue experimentation* test essentially evaluates whether one of reasonable skill in the art can make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation. *U.S. v. Electronics, Inc.*, 857 F.2d 778, 785, 8 U.S.P.Q.2d 1217, 1223 (Fed.

Cir. 1988). As long as the specification discloses at least one method for making and using the claimed invention that bears a *reasonable correlation* to the entire scope of the claim, then the enablement requirement of Section 112 is satisfied. *In re Fisher*, 427 F.2d 833, 839, 166 U.S.P.Q. 18, 24 (C.C.P.A. 1970).

Independent claim 1 recites that each of a plurality of semiconductor die stacks comprises “at least two semiconductor die permanently coupled together by adhesive ... and wherein the plurality of semiconductor die stacks *do not include a substrate*.” (Emphasis added). Similarly, claim 10 recites that each of a plurality of semiconductor die stacks comprises “at least two semiconductor die coupled together by set adhesive that has been cured ... and wherein the plurality of semiconductor die stacks *do not include a substrate*.” (Emphasis added).

In rejecting independent claims 1 and 10, the Examiner stated the following:

The definition of a substrate is a supporting material on or *in which* the components of an integrated circuit are *fabricated or attached*, or an insulating layer that components are formed on; therefore, since the dies contain circuits formed in semiconductor substrates the stack includes a substrate. Alternatively, the die stacks are formed on/attached to a holder albeit temporarily and therefore the holder is still within the definition of a substrate. As such, the claim is not enabled, since one skilled in the art to which it pertains, or with which it is most nearly connected, cannot make a stack formed on *what it excludes*.

Office Action, p. 2 (emphasis in original).

Regarding the enablement requirement of 35 U.S.C. § 112, first paragraph, Applicants assert that one of ordinary skill in the art would clearly understand how to form a die stack *without a substrate* based on the disclosure of the present application. *See, e.g.*, Application, page 17, line 16 – page 18, line 11. Indeed, this concept is discussed in great detail throughout the application and distinguishes present embodiments from prior art in which packages are assembled by sequentially stacking die directly on a substrate. For example, in various places

throughout the present application, a temporary holding surface is contrasted with a substrate. *See, e.g.*, page 12, lines 15-17.

The Examiner's assertion that one of ordinary skill in the art would be confused about the meaning of the term "substrate" is unfounded. Indeed, Applicants assert that based on the context in which the term "substrate" is used in the specification and based on the customary meaning of the term in the art, one of ordinary skill in the art would clearly understand the intended meaning. Further, Applicants assert that any confusion with respect to this claim feature merely arose because the Examiner attempted to provide his own definition for the term and that definition is unreasonably broad. Those skilled in the art would not make such an interpretation, nor would they be confused as to how to make or use the invention, as recited in the present claims.

First, the Examiner apparently asserted that a die stack inherently includes a substrate. *See Final Office Action*, page 2. This is clearly not the case. Indeed, the claim language set forth in claims 1 and 10, on its face, clearly indicates that the die stacks *do not include* substrates. Additionally, the specification clearly indicates that die stacks are eventually *stacked on* a substrate to form a package. They are not *integral with* the substrate. Further, the term "substrate" has a well known meaning in the art. Based on the context in which the term is utilized in the specification, one of ordinary skill in the art would readily discern the intended meaning. For example, the die stacks are described as being coupled to the substrate to form a package, such as the packages illustrated in FIGS. 2 and 3 of the application. *See e.g.*, Application, page 18, lines 9-11. Prior to coupling the die stacks to the substrate, the die stacks do not include a substrate, and certainly do not form a package.

While it is true that integrated circuit dies are formed within or on a semiconductor material, those skilled in the art would not interpret an integrated circuit die or chip as including a substrate, semiconductor or otherwise. That is, those skilled in the art would not interpret a die or chip as having a substrate. This assertion by the Examiner has no technical basis and those skilled in the art would not reach this conclusion. Rather, as is clear from the present

specification, those skilled in the art would fully appreciate that a semiconductor die is independent from a substrate.

Second, the Examiner apparently asserted that the temporary holding surface is a substrate. *See* Final Office Action, page 2. Again, this is clearly not the case. As set forth above, the term “substrate” has a well known meaning in the art. The definition that is apparently being asserted by the Examiner is unreasonably broad. Indeed, according to the Examiner it seems that anything on which a die stack is placed can be interpreted as a substrate. This clearly does not fit with the customary meaning of the term or the meaning of the term based on the context of its use throughout the present application. For example, as set forth in the present application, attaching a substrate to a die stack forms a package. *See e.g.*, Application, page 17, line 16 – page 18, line 11. However, when a die stack is placed on a temporary holding surface, a package is not formed. Attachment to a substrate is clearly understood by those skilled in the art to connote a permanent attachment, rather than a temporary placement.

In view of the remarks set forth above, Applicants assert that independent claims 1 and 10, as well as those claims dependent thereon, are fully compliant with the requirements of 35 U.S.C. § 112, first paragraph. Accordingly, Applicants request that the Examiner withdraw the rejection of claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph, and provide an indication of allowance for claims 1, 2 and 5-15.

**Rejection under 35 U.S.C. § 112, First Paragraph based on written description requirement**

The Examiner rejected claims 1, 2, and 5-15 under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. The Applicants respectfully traverse this rejection.

Regarding the *written description* requirement, the initial burden of proof regarding the sufficiency of the written description falls on the Examiner. Accordingly, the Examiner must present evidence or reasons why persons skilled in the art would not recognize a description of

the claimed subject matter in the applicant's disclosure. *In re Wertheim*, 541 F.2d 257, 262, 191 U.S.P.Q. 90, 96 (CCPA 1976). The written description requirement does not require the claims to recite the same terminology used in the disclosure. The patentee may be his own lexicographer. *Ellipse Corp. v. Ford Motor Co.*, 171 U.S.P.Q. 513 (7<sup>th</sup> Cir. 1971), *aff'd* 613 F.2d 775 (7<sup>th</sup> Cir. 1979), *cert. denied*, 446 U.S. 939 (1980). Moreover, any information contained in any part of the application as filed, including the specification, claims and drawings, may be added to other portions of the application without introducing new matter. Accordingly, if an application as originally filed contains a claim disclosing material not disclosed in the remainder of the specification, the applicant may amend the specification to include the claimed subject matter. *In re Benno*, 768 F.2d 1340, 226 U.S.P.Q. 683 (Fed. Cir. 1985).

In rejecting independent claims 1 and 10, the Examiner stated the following:

There is no support in the specification for the negative limitation that the die stacks do not include a lead frame.

Office Action, p. 3.

Applicants assert that the present application complies with the written description requirement of 35 U.S.C. § 112, first paragraph. Specifically, Applicants assert that sufficient support is provided in the specification for the negative limitation that the die stacks do not include a lead frame or a substrate. For example, numerous times throughout the application a die is explicitly described as being coupled merely to other die and not to a substrate. *See e.g.*, Application, page 17, line 16 – page 18, line 11. While Applicants concede that a lead frame is different than a substrate, the indication by the present specification that the die stack is not coupled to a substrate is sufficient to indicate that the die stack is not coupled to a lead frame either since those skilled in the art would appreciate that attachment to a lead frame is simply an alternative to attachment of the dies to a substrate. One of ordinary skill in the art would recognize this. Further, FIGS. 5A, 5B, 5C, and 5D all illustrate die stacks that are not coupled to a lead frame. The point is that the die stacks are formed before attachment to a permanent surface, such as a substrate or lead frame, for formation of a package. Those skilled in the art

would clearly recognize the description of the recited subject matter to exclude attachment of the die stack to a lead frame.

In view of the remarks set forth above, Applicants assert that independent claims 1 and 10, as well as those claims dependent thereon, are fully compliant with the requirements of 35 U.S.C. § 112, first paragraph. Accordingly, Applicants request that the Examiner withdraw the rejection of claims 1, 2 and 5-15 under 35 U.S.C. § 112, first paragraph, and provide an indication of allowance for claims 1, 2 and 5-15.

**Claim Rejections under 35 U.S.C. § 102**

In the Office Action, the Examiner rejected claims 1, 5, and 9 under 35 U.S.C. § 102(e) as being anticipated by Ball (U.S. Patent No. 7,371,612; hereafter “the Ball reference”). Applicants respectfully traverse this rejection.

Anticipation under 35 U.S.C. § 102 can be found only if a single reference shows exactly what is claimed. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 227 U.S.P.Q. 773 (Fed. Cir. 1985). For a prior art reference to anticipate under 35 U.S.C. § 102, every element of the claimed invention must be identically shown in a single reference. *In re Bond*, 910 F.2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990). That is, to maintain a proper rejection under 35 U.S.C. § 102, a single reference must teach each and every element or step of the rejected claim. *Atlas Powder v. E.I. du Pont*, 750 F.2d 1569 (Fed. Cir. 1984). Indeed, the cited reference must not only disclose all of the recited features but must also disclose the part-to-part relationships between the features. *See Lindermann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 U.S.P.Q. 481, 486 (Fed. Cir. 1984). Accordingly, the Applicants need only point to a single element or claimed relationship not found in the cited reference to demonstrate that the cited reference fails to anticipate the claimed subject matter.

Embodiments of the present invention are directed to one or more die stacks that are deposited on a temporary holding surface in a *completed* form. *See* Application, page 12,

lines 11-13. For example, using a stacking tip, a completed die stack may be positioned on a temporary holding surface (e.g., a film frame, gel pack, tape reel, or JEDEC tray) for later attachment onto a substrate. *See id.* Thus, the temporary holding surface is configured to temporarily hold the completed die stack for eventual transfer to a permanent coupling with a substrate. For example, the temporary holding surface may facilitate removal of a completed die stack from the temporary holding surface with a stacking tip. The die forming a completed die stack may be permanently coupled together in the stacked formation prior to moving the die stack from the temporary holding surface to the substrate. For example, the die stack may be cured at a high temperature prior to moving the die stack from the temporary holding surface to the substrate, wherein the curing may set adhesive between die of the die stack to permanently couple the die in the stack together. *See id.*, page 10, lines 1-2 and page 12, lines 13-15. Additionally, prior to attachment to the substrate, the die may be tested to ensure that all die in the stack are functional, thus forming a known good die stack. *See id.*, page 12, lines 15-17.

Accordingly, as amended, independent claim 1 recites, *inter alia*, “A temporary holding surface having a plurality of die stacks thereon ... wherein each of the plurality of semiconductor die stacks comprises at least two semiconductor die permanently coupled together, wherein the stack of at least two semiconductor die comprises a *known good die stack*, and wherein the plurality of semiconductor die stacks do not include a substrate.” (Emphasis added). As amended, independent claim 10 recites, *inter alia*, “[a] tape reel having a plurality of semiconductor die stacks thereon ... wherein each of the plurality of semiconductor die stacks comprises at least two semiconductor die coupled together by set adhesive that has been cured, wherein each of the plurality of semiconductor die stacks comprises a *known good die stack*, and wherein the plurality of semiconductor die stacks do not include a substrate.” (Emphasis added).

In contrast, the Ball reference fails to disclose a temporary holding surface or a tape reel having a plurality of die stacks thereon, wherein each of the die stacks comprises a *known good die stack*, as recited in amended claims 1 and 10. Accordingly, because the Ball reference is

deficient is this regard, Applicants assert that the Ball reference cannot anticipate independent claims 1 and 10, as amended. Thus, Applicants respectfully request that the Examiner withdraw the rejection under 35 U.S.C. § 102 and provide an indication of allowance.

**Conclusion**

In view of the remarks set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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